General

Preface Luc Van den hove

Should we put our future in the hands of technology?

Imec was founded 35 years ago: a good reason for its president and CEO Luc Van den hove to look back at some past achievements. Yet, he also takes the opportunity to look to the future – trying to predict how people and technology might complement one another in 2035.

A story that began 35 years ago ...

This year, imec celebrates its 35th anniversary. This makes it the ideal moment to look back on the impact we have had in the past years. Partly thanks to imec's groundbreaking work, we have moved from the age of microelectronics to the era of nanoelectronics: while chip technology in the mid-1980s was measured in terms of 1.25 micrometers, today imec works with 5 nanometer nodes (and smaller). In other words: the smallest elements of chips (transistors) have shrunk by no less than 250 times in the last 35 years!

Over the years we have also made a lot of progress in other research domains. Think of the efficiency gains that we continue to realize in solar cell technology, and our research results in sensor technology, flexible electronics, solid state batteries, etc. More recently, thanks to the merger with iMinds, we have been able to further strengthen imec's portfolio with unique expertise in (cyber)security and data science. In sum: in the last 35 years we have been on a journey that many in Belgium and abroad have watched with admiration.

Looking toward the future

As a renowned research center, we owe it to our partners, wider society and ourselves to look toward the future. We are happy to do so in this issue of imec magazine, with contributions from some of our scientists on how technology might impact society in 2035.

And let me point out that this is far from an easy question to answer... After all, it is not possible to predict the future – as the future doesn't exist.

> ***What is exciting about the future is that it has not been set in stone: it changes every hour, every minute, and even every second thanks to the decisions that we all continuously make. Still, we dare to take you on a journey to one possible future...***

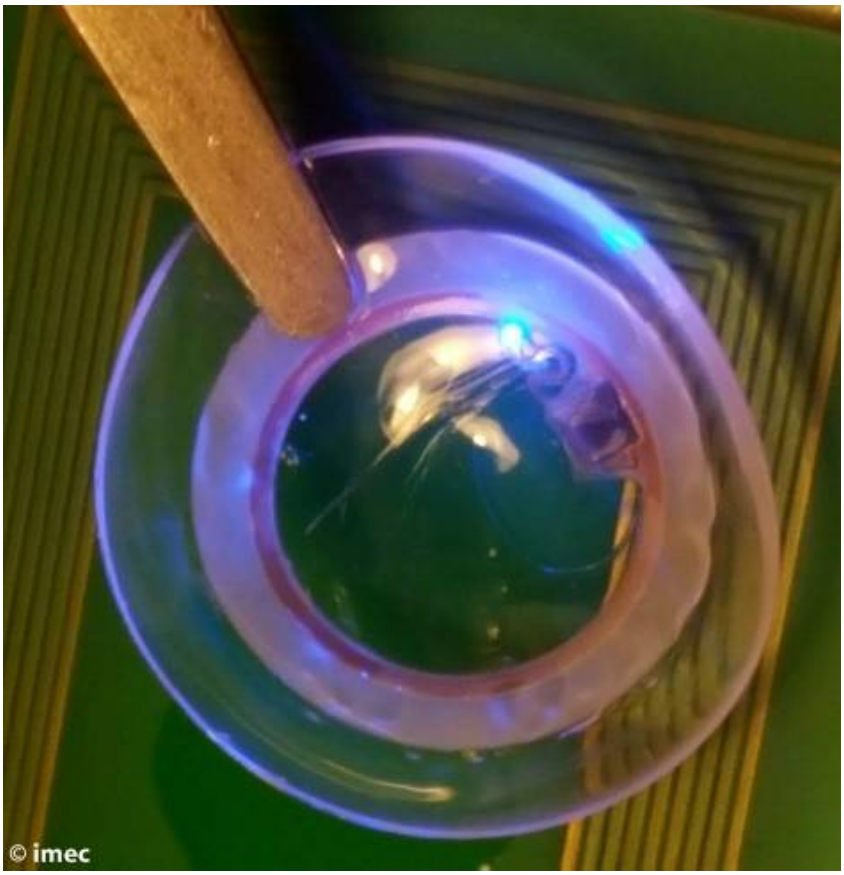
Toward manufactured human beings in a manufactured society?

Some of you might have read the book 'Homo Deus' by Israeli professor Yuval Noah Harari. In it, Harari describes how – in the 21st century – mankind (homo sapiens) has truly kicked off the war against hunger, disease and war; and how – going forward – mankind will also try to win the fight against death, thereby acquiring a god-like status – homo deus.

This may well not happen (and in my opinion, the chances of humanity winning its ultimate battle against death by 2035 are zero), but in any case, life in 2035 will be completely different to what it is today. We are already seeing an enormous evolution in the way we manage our health, for example through the emergence of wearables. And other tools that make us live more consciously and more healthily, or that help us make more conscious choices about our diet, our exercise levels and our lifestyles, are increasingly becoming part of our daily lives as well.

> ***Hence, I am convinced that the technologies that imec is working on today will prove crucial in tackling the biggest challenges of the 21st century – such as creating a healthy, sustainable world for everyone.***

For instance, in November, we announced the development of ultra-small and flexible micro-electronics which, in the long term, can be used to create smart contact lenses; contact lenses for the detection of eye disorders and drug-delivery.



As electronics get smaller and smaller, they can be integrated into a range of objects, such as contact lenses. The electronics consist of sensors to monitor the composition of the aqueous humor or mini containers with drugs that are released at pre-defined times.

Then there are our contributions to making immunotherapy (and more specifically CAR T-cell therapy) the preferred treatment for various types of cancer. If we want this treatment to be a real breakthrough that is considered for daily use in hospitals, its cost and complexity must be drastically reduced. Microfluidics and cell-sorting solutions – based on imec's chip technology – can be used to achieve this.

Imec technology also has a role to play in the domains of Industry 4.0 and smart mobility; you can read more about this in this edition of imec magazine. The same applies to sustainable food production. For example, did you know that in the next 50 years we will need to produce more food than humanity has produced in the last two thousand years? And that is while we are already using more than our planet can sustain...

Room for concern

The technological progress we have made in the last 35 years is certainly cause for optimism. But let's not be blind to the potential pitfalls: however incredible the potential of science and technology is, the chance of it being misused always remains.

That's why we have to make sure we do not neglect the ethical side of the story; also (and especially) we – as researchers – must take the time to consider ethical issues. Perhaps we don't do this enough at the moment ...

But the same principle applies: the future is not set in stone.

> ***We are all responsible for ensuring we use technology in ways that benefit the whole of society. I believe that these considerations are just as important – and just as spectacular – as the development of a 'homo deus'!***

Finally

If I look back at the last 35 years, I am both astonished and amazed at how much our lives have changed. When I started at imec as a young Ph.D. student, smartphones and smartwatches were just figments of imagination. No doubt that in 2035 we will look back with amazement at how we live now...

But today, I look first and foremost with pride at what we have created at imec in the past three and a half decades. The fact that imec has made a contribution to the technology behind almost every smartphone, smartwatch and computer is a nice example. And I am convinced that in the next three and a half decades we can generate even more impact. Of course we must be careful to not put our future completely in the hands of technology, but technology is the perfect tool to tackle the challenges of the 21st century. And it is down to humanity to continue to mark out our journey and so determine our own future!

And here, imec will continue to play a central role, by combining world-class technological expertise with societal research, and by working with businesses and research partners from across the globe that, together with us, want to make a real difference.

I hope you will get a great deal of inspiration from reading our visions of the future...

About Luc Van den hove

Luc Van den Hove has been chief executive officer (CEO) of imec since July 1, 2009. He started working at the organization in 1984, researching silicide and interconnect technology. In 1988 he became manager of imec's micro-patterning group (lithography, dry etching), and then in 1996 was appointed director of the R&D of the unit process steps group. He was appointed vice president of the silicon process and device technology division in 1998. In January 2007 he became EVP & COO. Luc Van den Hove did his Ph.D. in electrical engineering at KU Leuven. He has (co)authored over 100 publications and gives talks at international conferences.